INSTITUTE *of* STATISTICS
Oxford

Bulletin Vol. 13 *March, 1951* *No. 3*

THE INAPPROPRIATENESS OF SIMPLE 'ELASTICITY' CONCEPTS IN THE ANALYSIS OF INTERNATIONAL TRADE

Recent disturbances in international economic relations have once more focussed attention on the analysis of the effects of changes in exchange rates on the balance of international payments. The method of analysing them by constructing functions of demand and supply of foreign exchange in terms of its price seems to have been generally accepted without further questioning. In an effort to come to determinate conclusions which might serve as a guide for policy, simple models have been constructed. The question whether the conclusions derived from them, indeed the concepts used, can be applied to real life is usually neglected. Income effects, if they are analysed at all, are brought in as a subsequent 'complication.' Occasionally the further assumption is made that the elasticity of supply of exports and imports underlying the function of the supply and demand of a currency is infinite. In all these manipulations the functions are considered to be smooth and continuous, independent of each other and reversible. Hence partial equilibrium analysis is applied to them without any qualms.

In this and a subsequent paper we shall contend that this approach to the problem is erroneous. In the analysis of international economic relations such concepts as 'elasticities'[1] and 'equilibrium' rates of exchange are inappropriate in the first place because the commonly component 'elasticities' are *interdependent*. Furthermore, *given* supply and demand functions or *given* 'elasticities' cannot be used as guides to policy because the shape and positions (if the fiction of a 'function' is maintained) of the 'functions' or the amount of the 'elasticities' will depend upon (1) changes in the market structure, (2) changes of the level of income, (3) changes of the level of employment, (4) changes in the distribution of income, (5) changes in the relevant prices themselves, (6) reactions in other countries. Some of these factors cannot be separated analytically from a proper examination of 'elasticity' reactions; others, though analytically separable, are separated at the cost of lack of realism and thus are useless for predictions or policy recommendations. In other words, statements of the type 'devaluation is indicated if the sum of the elasticities is . . . etc.' have as little meaning as statements, so fashionable in pre-Keynesian days, like ' unemployment will decrease on wage-cuts if the elasticity of demand for labour is . . . etc.' There is no given demand schedule irrespective of the measure proposed. The very discussion in anticipation of measures, and those measures themselves, will alter the ' schedule '.

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[1] 'Elasticities' appears in the following in inverted commas to remind us that we are concerned with irreversible reactions to price changes and not with movements on independently given demand and supply curves.

It is regrettable but inevitable that no single new method of analysis can be put into the place of the old approach. This limitation is imposed by the complexity of the problem which the customary method artificially, and mostly tacitly, assumes away. As far as policy is concerned, the arguments of this paper suggest the following conclusions. (1) Exchange rate adjustments *alone* are unsuitable remedies where international maladjustments are *large*. (2) They are also unsuitable if they would have to be used *repeatedly* and fairly frequently. (3) It is false to argue that appreciation of a curency is always a remedy when deficits cannot be eliminated by depreciation because ' elasticities ' are too low. (4) Even when and where exchange rate alterations promise to be suitable remedies, they are likely to be insufficient unless accompanied by *full employment* (or, often, ' over-full ' employment) *policies* in *creditor* countries; measures to counteract undesirable distributional effects or effects on internal monetary equilibrium; and possibly measures against certain oligopolistic or monopolistic reactions. Many policy recommendations in the past seem to have disregarded the overwhelming importance of employment policy and the level of employment for international economic adjustments.

Not only are the theoretical concepts and measures hitherto used in the analysis of foreign trade adjustments of doubtful value. Even more serious objections can be raised against attempts to establish statistically the order of magnitude of these ' elasticities '. Quite apart from the shortcomings of the data and of the statistical methods used,[1] not enough attention has been paid to certain logical flaws of the procedures adopted and the lack of realism of their assumptions. Both the attempt to use time series and correlate data of different periods for the same country, and the method of comparing the relationship of data of the same period of different countries, involve simplifications or neglect of inter-relationships which reduce the value of the results obtained. Indeed, the price and income ' elasticities ' and propensities thus obtained really amount to nothing more than mere historical descriptions and can yield no inference to causal relationship. In the absence of knowledge of the functional connection between the path of adjustment and its end position no predictions can be made. Any formal equations (*e.g.* on ' optimum tariffs ' or the criteria for successful devaluation) purporting to provide a basis for accurate extrapolation, really do not give more than descriptions derived from past data which are of small use for gauging future possibilities.

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[1] Cf. e.g. recent papers by Orcutt, Machlup. These efforts to criticise the statistically calculated ' elasticities ' serve as arguments for the rehabilitation of devaluation (i.e. the price mechanism) as a suitable remedy for disequilibrium. They were meant to dispel the doubts that had risen as a result of the low ' elasticities ' discovered by the statisticians. But these very useful criticisms of crude statistical methods pay little attention to the objections analysed in this paper, which cast doubt on the possibility of establishing any trustworthy and useful functional relationship of that kind at all. It seems that even if it is true that the ' required elasticities ' are smaller than was thought, and that the ' actual elasticities ' are larger than statisticians tell us, the definitions used by both the critics and the criticized are misleading. Forces which are ignored by their assumptions are likely to swamp the favourable effects of favourable ' elasticities '. The attempted rehabilitation of devaluation must, to that extent, fail.

(1) THE INAPPROPRIATENESS OF PARTIAL EQUILIBRIUM ANALYSIS

The schedules of the demand and supply for foreign exchange, like the schedules of the demand and supply for labour, or for savings and investment, are aggregates to which the technique of demand and supply curves, with its implicit assumption of other things remaining equal, must be applied with great caution, even in the simple case of models of *comparative statics*.[1] When it comes to analysing actual situations the comparative static approach breaks down. Not only will the change in one of the variables result in a change *of the same order of magnitude* in the others, but *dynamic effects* will be set in motion which might *swamp the original cause of* the change.

Wherever foreign trade forms a more than negligible part of a country's national income, partial equilibrium analysis is no longer applicable. It is not legitimate to draw up a demand curve for imports on the assumption that all other prices remain the same. The demand for imports will not be independent of the change of prices of home-produced goods. That is to say, the conventional demand curve based on the assumption that other things remain the same, is subject to shifts. These shifts themselves are not simple, as some models try to envisage, but the result of an intricate network of relationships. Thus if, for example, we devalue our currency, demand for imports will depend :

(*a*) Upon the supply 'elasticity' of home-produced goods which are substitutes for imports, which in turn is affected by

(*b*) the home supply 'elasticity' of, and the foreign demand 'elasticity' for our exports. For the supply 'elasticity' of home substitutes for imports will be smaller, the greater the diversion of factors (and goods) used up in increasing exports. A substantial increase in exports leaves fewer factors available for substituting home goods for imports.

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[1] This objection on the plane of comparative static analysis is similar to Mr. Sraffa's criticism : ' This point of view (i.e. the particular equilibrium analysis) assumes that the conditions of production and the demand for a commodity can be considered in respect to small variations, as being practically independent, both in regard to each other and in relation to the supply and demand of all other commodities. It is well-known that such an assumption would not be illegitimate merely because the independence may not be absolutely perfect, as, in fact, it never can be : and a slight degree of interdependence may be overlooked without disadvantage if it applies to quantities of the second order of smalls, as would be the case if the effect (for example, an increase of cost) of a variation in the industry which we propose to isolate were to react partially on the price of the products of other industries, and this latter effect were to influence the demand for the product of the first industry. But, of course, it is a very different matter, and the assumption becomes illegitimate, when a variation in the quantity produced by the industry under consideration sets up a force which acts directly, not merely upon its own costs, but also upon the costs of other industries ; in such a case the conditions of the ' particular equilibrium ' which it was intended to isolate are upset, and it is no longer possible without contradiction, to neglect collateral effects.' ' Laws of Returns Under Competitive Conditions '—Piero Sraffa, ' The Economic Journal,' 1926, p. 538-9.

(*c*) the changes in income distribution accompanying the demand and supply changes which will alter the propensities to save, invest, and import.[1]

Similarly, the 'elasticity' of supply of imports is a function of the home 'elasticity' of supply of exports and of the foreign 'elasticity' of demand for our exports. If, after devaluation, foreigners spend more on *our* exports in terms of their own currency, goods and factors will be released abroad, which will make it more difficult for them to divert resources from *their* exports (our imports) to the home market, when the prices of their exports are reduced. A smaller total expenditure on our exports, on the other hand, will make this diversion easier and thus increase the 'elasticity' of supply of their exports (i.e. our imports.) Both home demand and supply ' elasticities ' depend upon the foreign demand and supply ' elasticities ' and, by the same reasoning, the foreign ' elasticities ' depend upon the home ' elasticities '. The ' elasticities ' are therefore interdependent.

To apply to this type of relationship the term ' price elasticity ' is therefore misleading. The reactions to price changes are lumped together into an elasticity concept as if they were similar to the reaction experienced in the case of a commodity the demand for which is an infinitely small fraction of total demand. In this latter case the repercussions can legitimately be neglected, whereas in our case, just as in the case of the general internal economic equilibrium, reactions are determined by shifts in other prices.[2]

Assume two countries, A and B. A exports textiles and B exports wheat, but both produce some wheat and some textiles themselves. A depreciates its currency. Textile producers in A will now have an inducement to export more, for the price of textiles in B will have risen in terms of A's currency. How great will be the increase in A's textile exports for a given rise in their price in B ? *How great is the supply ' elasticity ' of A's exports* ? This will depend on a number of factors, but amongst them on A's demand ' elasticity ' for imported wheat. If its demand is ' inelastic ' factors will be released for the production of textile exports. If, on the other hand, its demand for wheat imports is ' elastic ', the increase in exports for any given rise in their price will be smaller. But A's demand ' elasticity ' for wheat imports is not given independently. It depends on a number of factors, amongst them on its supply ' elasticity ' of textile exports. The more textiles are exported for any given rise in their price (in B in terms of A's currency), the fewer factors are available to produce wheat at home, and, hence, the lower the demand ' elasticity ' for wheat imports. The answer to our original question, what determines the supply ' elasticity ' of A's exports is that it is partly that supply ' elasticity ' of exports itself. The same can be shown to hold for any other of the ' elasticities '.

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[1] This particular aspect, however, will be treated in a subsequent article.

[2] This explains the paradox that the formulae elaborated for the level of 'optimum' tariffs is based seemingly on *foreign* ' elasticities ' alone : they implicitly contain a large element of the home ' elasticity,' being co-determined by them.

This interdependence does not, of course, mean circularity. A determinate solution would result when the various ' elasticities ' are consistent with one another. But the important point is that a country's response to price changes is not simply a funcion of ' tastes ' and ' technical conditions,' but also a function of the changes in demand and supply abroad which will determine the availability of substitutes and factors to produce substitutes. It is well-known that e.g. the supply ' elasticity ' of exports is partly a function of the demand ' elasticity ' for imports. If the latter is low, a large amount of purchasing power will be absorbed by dearer imports, thus setting free domestic products for exports, and/or factors capable of producing exports. But one must remember that the demand ' elasticity ' for imports depends, in turn, on the supply ' elasticity ' of exports. For demand will be more elastic, the smaller the increase in the supply of exports which absorbs factors that could be used for producing import substitutes. And the two home ' elasticities ' will depend upon the foreign ' elasticities ', because the latter codetermine the changes in exports and imports. Thus, a low foreign supply 'elasticity,' for example, coupled with a low home demand 'elasticity' will reduce the home supply ' elasticity '. For if home demand ' elasticity ' is less than unity, the value of imports will rise by less, the smaller is the foreign supply ' elasticity ' and thus fewer goods and factors will be released for export purposes than would have been available, had the foreign supply 'elasticity' been greater.

The treatment of the effects of exchange depreciation in terms of four independent given demand and supply ' elasticities ' oversimplifies and falsifies the problem. A change in any one of them will inevitably affect the others, usually after a time. The assumption of the constancy of ' elasticities ' in time, even if we ignore changes of income, employment and distribution, is therefore hardly justified. An autonomous change in any one will have inevitable repercussions upon all others.

Determinate and independent demand elasticities could be assumed if supply were infinitely elastic. Since this is impossible in conditions of full employment, it would involve the assumption of unemployment and excess capacity. But this case, the one most favourable to an analysis in terms of given demand ' elasticities ', is least suited to a *policy recommendation* of exchange rate adjustments. Not only is demand likely to be highly ' inelastic ' without any relief from low supply ' elasticities ' (as would be the case under full employment) but deficits arising in conditions of unemployment are not necessarily signs of disequilibria which should be cured by exchange rate adjustments.

(2) Asymmetrical Reactions Resulting from Employment Effects

Many authors assume in their analysis of foreign exchange problems both independent and smooth demand and supply functions. In the last section it was argued that the functions are interdependent. In this section we shall consider certain reactions to changes in the value of the currency and consequential price changes which may lead to asymmetrical reactions of the type which is occasionally formalized in ' kinked ' curves. The view that functions tend to be smooth depends on coupling the assumption of full employment with that of high flexibility and absence of oligopoly. In actual fact imperfect flexibility and induced income variation will tend to produce different reactions to changes in the rate of exchange (different ' elasticities ') according to the *direction* of the change, and for two reasons. First because of oligopolistic relationships between firms. Second because of oligopolistic relationships between countries. Both are largely a function of the level of employed capital and manpower capacity.

The supply of exports at full employment will probably be ' inelastic ' for a price rise and ' elastic ' for a fall because home demand can easily absorb exportable goods. It is, as it were, the suction from a fully employed and relatively riskless home market which results in this asymmetry : goods are more easily absorbed than released in response to price alteration. A low supply ' elasticity ' coupled with a low foreign demand ' elasticity ' will mitigate the fall in foreign exchange receipts and, coupled with a high foreign demand ' elasticity ' will reduce the increase in those receipts.

If, on the other hand, unemployment and excess capacity prevail, supply ' elasticities ' for price rises may be high, approaching infinity, especially in industrial and plantation economies, and might be low for further price falls as the resistance of trade unions against wage cuts is undermined and bankruptcy forces (and enables) recapitalisation, even if the exchange rate of the country is held rigid in face of the depression. This however is not the full story.

The limitation of international reserves and the necessity to remain competitive would, in a world without commercial restrictions and without currency control have the same effects upon the policies of *countries* as excess capacity in oligopolistic conditions has on the policies of *firms*. It would make demand inelastic for downward and elastic for upward price movements. For a country which cannot afford to have its reserves further depleted would be forced to follow a devaluation or deflation abroad with much greater force than it would be inclined to follow an appreciation or inflation abroad. In other words, price cuts will be accompanied by price cuts of rival products but price rises will not. This effect will reinforce the asymmetry brought about by entrepreneurial reactions.[1]

The absence of a firm full employment policy will, beyond a certain point, have the same effect in a ' rich ' country as the insufficiency of reserves in poor areas : the ' creditor ' country will resist attempts by others to wipe out the deficit as the reduction of the favourable balance would create unemployment. On the other hand—*e.g.* Germany in the first half of 1950—they would gladly supply more exports and/or take fewer imports. Thus both small reserves and the absence of full employment policies induces oligopolistic asymmetry of reaction.

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[1] If Prof. Duesenberry's assumption Cf. ' Income, Saving and the Theory of Consumer Behaviour ', Harvard, 1949, should prove correct that consumption is a function not merely of current, but on past peak income, a further asymmetric influence would have to be expected. On the one hand downward readjustments will be difficult as import propensities will be higher when a (deficit) country tries to cut its imports that when it endeavours to expand them. On the other hand the shock imparted abroad by any one (surplus) country will be mitigated. If the unstable (surplus) country is an important (potential) competitor in capital goods industries the latter effect might not be sufficiently potent a stabilising influence to offset the difficulties encountered by the deficit countries as a result of the former. In that case the downward bias of the system is reinforced by this effect.

A similar asymmetry will prevail on the demand side. In conditions of over-full employment the demand for imports becomes relatively ' inelastic ' for foreign prices rises (cf. the sale of Belgian steel to the U.S. at rising prices) and ' elastic ' for foreign price cuts. Price rises will not be as strong a deterrent, as price reductions are a stimulus to imports. This tendency will be reinforced if home producers of import substitutes—who are likely to be working at or above capacity—follow the price rises of imports but are unwilling to match price reductions. They follow rises because they can thus easily increase their profits; they refuse to follow reductions because they do not object to having the pressure of excess demand reduced by foreign supplies.

Conversely in conditions of heavy unemployment and excess capacity, demand for imports probably becomes ' inelastic ' for price cuts because domestic competitors try to match these cuts, refusing to allow their excess capacity to be increased further; and it will be highly ' elastic ' to price rises because over a wide range domestic supplies can be substituted without a rise in their prices. The downward ' inelasticity ' will be reinforced if losses have been suffered and financial reserves exhausted, while certain fixed costs have to be met.

This means devaluation as a remedy will be handicapped in boom conditions, when demand abroad might be expected to be ' elastic ', by the low supply ' elasticities ' of the devaluing country. Hence a *large* devaluation would be required in order to be effective and the objections to such a large devaluation arise out of its effects on real income and the home inflationary situation. Low supply ' elasticities ' which may be the result of technical limitations or, in the case of manufactured products, of monopolistic pricing policies which have the same effect as rapidly rising costs, will affect the terms of trade less unfavourably than higher supply ' elasticities '. The low demand ' elasticity ' for imports will not, on the other hand, be eased by a low foreign supply ' elasticity '.

In a depression, the hopes which might be aroused by high supply ' elasticities ' are dashed by low foreign demand ' elasticities '. It appears therefore that the attempt at rehabilitating devaluation as a suitable remedy which are based on the fact that low supply ' elasticities ' relieve difficulties created by low demand ' elasticities ' ignore the important fact that these ' elasticities ' must be related to employment and capacity levels. The situation then no longer looks so hopeful.

There is also another type of asymmetry, besides the price and output policies of *firms* in imperfectly competitive markets which is caused by the policies of *countries*. Unless there is rigid adherence to an international code of rules, any attempt to shortcut piecemeal adjustments by measures affecting the *whole* economy indiscriminately, *e.g.* tariffs, restrictions or devaluation, will be matched by competing countries. Whole countries will behave analogously to oligopolistically competing firms and their reactions cannot be neglected. Reactions to the generation of import surpluses will be for a number of reasons more rapid and more drastic than attempted cure of export surpluses, especially if the reserve position of the ' creditor ' countries is not comfortable. Even if it were, the employment effect might force retaliation (*e.g.* U.S. measures against the import of gloves, hats, watches, etc.).

One of the conclusions is that the maintenance of full employment, or perhaps even what is now termed ' over-full ' employment in surplus countries is a necessary (though not a sufficient) condition of success in any attempt to adjust international disequilibria through the price mechanism, *i.e.* by devaluation or appreciation as contrasted with direct controls. Low supply elasticities might be overcome in time by the depreciating country through fiscal policy. Retaliatory actions to price reductions either on the part of private firms or of whole countries are less probable if the creditors are in any case fully employed. If unemployment prevails in the surplus country, exchange rate adjustments will be unsuitable. International institutional safeguards against unemployment are therefore of the utmost importance if a restoration of the international price mechanism is to be attempted without results fatal to weaker countries. The habit of talking about ' elasticities ' without specifying the present and expected level of employment in all countries under consideration is highly misleading. The ' elasticities ' of demand and supply of exports and imports are largely determined by the level of employment : they are therefore highly unstable through time. ' World ' or ' national ' ' elasticities ' in the short run are far too dependent on short run factors. In the longer run (or on the average over business cycles), when employment no longer plays this over-riding influence, conditions are so likely to change as to render the concept also largely meaningless.[1]

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[1] Thus the experts' report submitted to U.N.O. on National and International Measures for Full Employment is to be warmly welcomed as it puts forward schemes to deal not only with this problem but also on the closely related problem of unequal technical progress.

The success of the 1949 devaluations supports rather than weakens our conclusion. The effects of devaluation were swamped by the U.S. revival. The price of the main U.S. imports from the devaluing area *rose in terms of dollars*. At the same time the fall of U.S. export prices was checked and U.S. delivery dates lengthened : the favourable effect of devaluation on the competitive position of the devaluing countries was not cancelled by further deflation in the U.S. Thus the superficial impression that the striking reduction in U.S. exports was due to high demand elasticities is largely misleading. The employment factor played the most important role. Moreover the price and wage increases in the rest of the world have only been delayed and are certain to come. In other countries the rise in the dollar price of exports helped to maintain stability, *i.e.* the situation was saved in spite of rather than because of devaluation. The reduction of dollar exports was decided upon and actually began prior to devaluation, and there has been some recovery in the volume of U.S. exports from the low point. As the reduction in the U.S. exports occurred when home demand in the U.S. was rising the competitive effort by U.S. business to retain foreign markets slackened. Any reversal of the trend in the U.S. would lead to renewed acute dollar crisis. Recent experience thus confirms completely the supreme importance of business activity in the dominant country, the U.S., for international economic readjustment.

(3) ASYMMETRICAL REACTIONS RESULTING FROM VARIABLES OTHER THAN PRICE

Whenever competition is monopolistic or oligopolistic, and when changes in income are significant, the simplifying assumption that price is the chief variable is unsound. Frequently it is argued that although depreciation may make matters worse in the short run because demand will be inelastic, it is likely to improve the balance in the long run when ' elasticities ' will be higher. We shall argue below that in the ' long-run ' multiplier and investment effects will have had time to work themselves out with the result that any price effects will be swamped. Let us disregard these effects for the time being and accept the assumption that other things remain the same as far as income and employment are concerned. The argument then rests on the assumption that a readjustment of the productive structure and/or the overcoming of market imperfections will take time. But this ignores the fact that the interests to be displaced need also time to organise their defence, and that imperfections and low ' elasticities ' can also be built up by sellers in time. An attack on, say, the American market will have to meet a counter-attack as soon as it promises to be successful. The whole concept of a long-run demand schedule in conditions of uncertainty and oligopoly is of dubious value. If advertising is successful in capturing a market, it is likely to be no less successful when resistance or the struggle for recapture are organised.

In order to analyse the relationship between price changes and quantities demanded a number of variables besides shifts in demand due to advertising are relevant which are frequently ignored. Thus, demand is not only a function of price but also of a *change* of price. Price changes shake customers out of their rut and make them experiment. Strictly speaking, demand curves do not apply, for the amount demanded will depend upon the size and the speed of the preceding change in price. Steps on such a ' curve ' are not reversible and not only point elasticities but also arc elasticities become meaningless. The ' equilibirum ' price, if any, is codetermined by the path by which it is reached.

Price is not the only important variable determining demand : the speed of delivery, available stocks, discounts and terms of payment are others. The existence of unemployment usually bestows advantages upon a country with respect to delivery dates and the availability of stocks of manufactured goods. It is a moot point whether and how much unemployment would spell greater all-round internal flexibility, but there is no doubt that excess capacity, plentiful stocks and a reservoir of labour will make for speedier deliveries of orders in existing, and for capacity to undertake work in new, lines of production. The real cost of this type of competitive advantage is partly borne by the unemployed, and not expressed in lower costs and prices. In order to become more competitive, greater efficiency and price reductions might be of little use in comparison with the creation of unemployment and excess capacity (however objectionable).

The advantages of free discounts and easy terms of payments are largely a function of the size of the firm. Large monopolistic concerns with more information about their customers have advantages in foregoing liquidity and shouldering risks which small firms, though possibly more efficient and offering lower prices, cannot emulate. Similar advantages accrue to countries with organised capital markets.

There are numerous other important factors amongst which only investment outlay on initial advertising can be mentioned here, where again the large firm has an advantage. Thus monopoly and unemployment bestow advantages in factors determining demand which are often of greater significance than price variations. An analysis which pays only attention to price and quantity variations neglects these other variables which play a more important part in the oligopolistic armoury than price competition.

(4) SMALL *v.* LARGE DEPRECIATION

Sometimes it is argued that if a small depreciation is not effective, a large one must be, for demand must at some price become elastic. To this, there are two replies : first, it is now well recognized that price adjustments often fail to do their work where the changes are very large. A large depreciation may merely give rise to an additional bout of inflation and aggravate the foreign exchange difficulties.[1]

Thus the country may not succeed in curtailing imports and pushing exports. If it does succeed, on the other hand, by applying deflationary measures, the reduction of imports and the foregoing of exportable goods will necessitate a reduction in the standard of living. Now the same results in the correction of the foreign balance can be achieved with a smaller reduction in the standard of living if import reductions are *selective* and not indiscriminate. The change in the composition of imports can be more suitably geared to domestic social policies than if the work is left to the price mechanism.[2]

We conclude that depreciation may not be able to bring about the desired adjustment, or if it does succeed, it will be at a cost which may well be too high. Infinitesimally small changes in the exchange rate, to which the analytical and policy objections apply with less force, are likely to be ineffective. Large changes, on the other hand, cannot be analysed in terms of constant ' elasticities '. The fact that a large depreciation will make demand more ' elastic ' does not strengthen the case for devaluation if income and employment effects swamp the price effects, or if the reduction in real income is unnecessarily and undesirably severe.

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[1] It is curious for example, that Professor Smithies should argue that it is a point in favour of devaluation that import controls will be more easily administered after devaluation, without pointing out that the burden is merely shifted, and domestic anti-inflationary controls are put under additional strain. (A. Smithies, *Review of Economics and Statistics*, 1950, and *Quarterly Journal of Economics*, 1950).

[2] Sir Hubert Henderson, The Havana Charter, *American Economics Review*, 1950.

(5) Depreciation *v.* Appreciation

The argument that appreciation would improve the balance where depreciation fails because of low ' elasticities ' rests on very special assumtions. In order to refute it, it is not necessary to assume kinks in the curves although the existence of certain kinks will strengthen the conclusions which can also be derived from smooth curves. It is quite sufficient to assume that elasticities change in a certain way with the movement in the exchange rate in order to show that it is not true that *some* change in foreign exchange rates will *always* bring about a restoration of equilibrium. Quite apart from dynamic complications to which we have referred and which we shall discuss again, it is perfectly possible that even in the case of smooth demand and supply functions both appreciation and depreciation will worsen the balance. We ignore here the problem that the curves representing demand and supply of foreign exchange beg the whole question of the four ' elasticities ' because each of them lumps together two, *e.g.* the demand for foreign currency expresses both the demand ' elasticity ' for imports and their supply ' elasticity '.

In Fig. (i) the demand for foreign exchange is represented by D and the supply of foreign exchange by S. The rate of £ per $ is plotted on the Y axis so that an upwards movement represents depreciation and the total receipts or expenditure in terms of $ are plotted on the X axis. If we start from a position of disequilibrium (D exceeding S) with an exchange rate of OR, both a depreciation to OR′ or an appreciation to OR′ will worsen the deficit. The shape of the curves is a perfectly possible one, at least over a range. The only limitation of their shape is that the D curve must slope down to the right (dollar expenditure on imports, with certain negligible exceptions, must decrease after depreciation), and the S curve, which may slope to the right or to the left, cannot slope to the left in such a way as to decrease the area of the rectangle OMEQ. (Fig. ii). This rectangle is the £ outlay on exports which cannot (with certain negligible exceptions) decrease. Hence at some point the S curve will cut the D curve from below and this will be a point of stable equilibrium E. (Fig. ii). But this may well be one of those cases where the invisible hand does its work by strangulation.

The difficulties of adjustment are aggravated if the curves at the ruling rate are kinked. (Fig. iii). We have argued that the change of the exchange rate itself will tend to make for such a kink so that whatever the exchange rate happens to be, in some conditions any alteration of it will lead to an increase in the deficit.

The position may be similarly represented in terms of £. The supply of dollars in terms of pounds constitutes the demand for pounds in terms of dollars. We trace the $ per £ rate on the Y axis and the total £ receipts and outlays on the X axis. Fig (iv) shows the case where depreciation to OR′ (which is now a downward movement on the Y axis) and appreciation to OR′ both deteriorate the balance; (Fig. iv) shows the 'inevitable equilibrium ' exchange rate which results from the fact that the total sterling

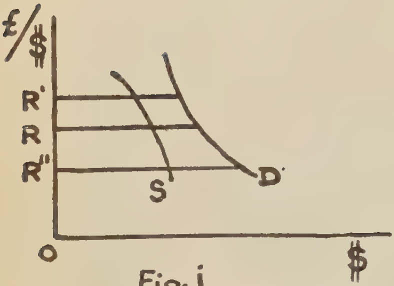

Fig. i

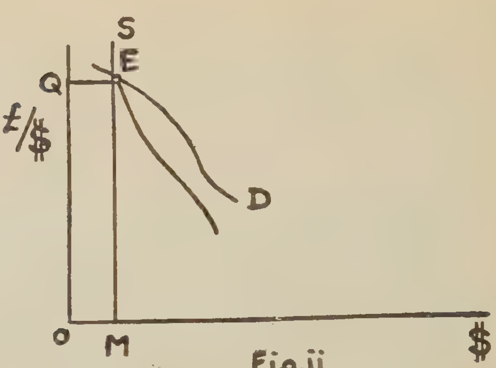

Fig. ii

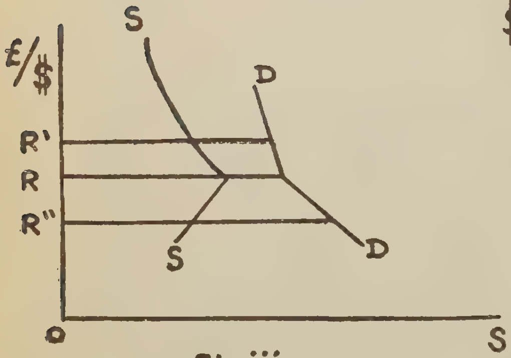

Fig. iii

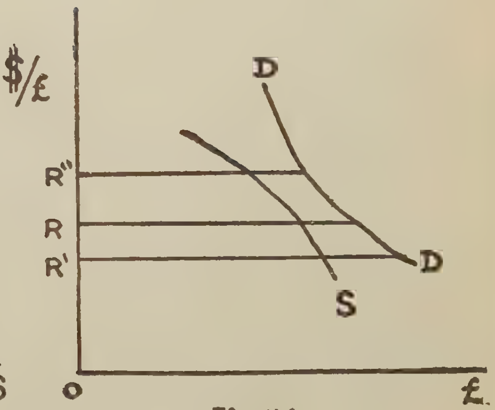

Fig. IV

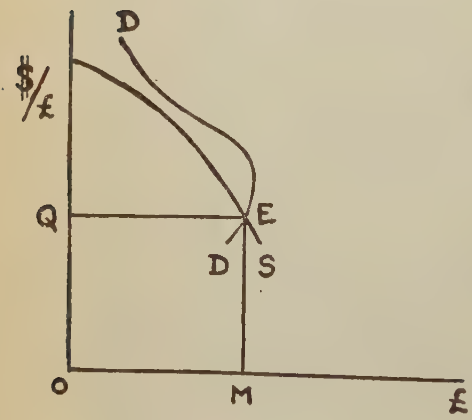

Fig. V

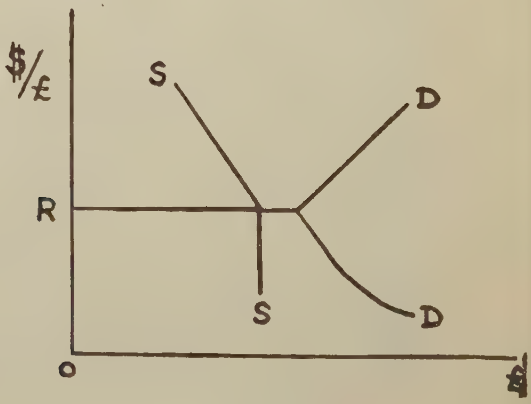

Fig. VI

expenditure must decrease at some point : hence the D curve must cut the S curve from above and this will be a point of stable ' equilibrium ' E. Fig (vi) shows kinked demand and supply curves, the kink depending on the actual exchange rate which has come to be established. Although the D curve can slope to the right or to the left, its slope to the right upon devaluation can in the worst case be a rectangular hyperbola for the demand for dollars, expressed by the rectangle under the D curve, can at worst be constant.

Similar kinks in the schedules may also be the result of the fact that international competition is oligopolistic not merely in the sense of entrepreneurial reactions in the markets of most manufactured goods but also in the sense described at greater length elsewhere,[1] that the reactions of the competing national economies to policy changes in (powerful) economies are of an oligopolistic character. In their policy decisions they take note of the policy of the countries with which they compete.[2] To give an example, devaluation or deflation in a powerful country which has the impact effect of making all entrepreneurs in that country *more competitive* abroad, has usually been automatically followed by the competing economies as they would otherwise have been denuded of liquid reserves. Appreciation, on the other hand, need not be followed by an appreciation or inflation abroad. Indeed unless the rest of the world is already fully stretched the appreciation will lead to a loss of trade.[3] Hence a country contemplating a change in its exchange rate is in an analogous position to the oligopolistic entrepreneur whose behaviour has been represented by a kinked demand curve. The reactions need not be certain. The mere risk may be a sufficient reason to refrain from experiments if the country's international liquidity position is precarious.

T. BALOGH.
P. P. STREETEN.

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[1] *e.g.* T. Balogh, The International Implications of Full Employment, in *The Economics of Full Employment*, Oxford University Institute of Statistics, 1944.

[2] This reduces the analytical value of efforts to circumvent the obvious and acknowledged difficulties of the time correlation analysis of elasticities by an analysis of simultaneously existing relations between the price and the quantity of foreign transactions of different countries. The fact that lower prices were associated with higher export figures does not permit us to conclude that, had the countries suffering from higher prices reduced their prices, their exports would have risen in the proportion indicated by the relation of price and exports between high and low countries. This difficulty is far more basic and ineradicable than the obvious statistical difficulty of measuring relative prices in a world where even certain raw materials, *e.g.* coal, were sold in highly imperfect markets.

[3] Under certain circumstances *e.g.* when the appreciating (or inflating) country is the main supplier of essential commodities its customers might gain if they followed suit (*e.g.* the U.S. in 1946–7).

MACHINERY PRICES BETWEEN THE WARS

(*a*) INTRODUCTION

In any investigation into changes in real investment or into replacement and depreciation policies of industry, we find figures for new investment or replacements expressed in terms of current or original prices. To acquire significance such prices must be reduced to some common basis by means of a capital goods price index. Such an index does not exist for the whole inter-war period, although Colin Clark[1] has used some such indices in his study of real investment in 1924 and 1930. This paper[2] is an attempt to supply a constituent part of such an index.

Such an index already has been worked out for the U.S.A. by Fabricant for use in his study of capital consumption and adjustment.[3] His methods are unfortunately not applicable here without extensive field work, since the wholesale price indices published by the Board of Trade are far fewer than those published by the U.S. Dept. of Labour, and since no indices for individual types of capital goods (*e.g.* railway rolling stock or machine tools) have been published by private industry or government departments here. Practically the only relevant indices already published are the various attempts at building cost indices, the index for commercial vehicles published by the Society of Motor Manufacturers and Traders and the estimate of the cost of a 7,500 ton tramp steamer published by Fairplay. All these indices have certain defects for our purposes, and certainly do not form an adequate basis for estimating a general capital goods price index. It is hoped that in the future the work below will be supplemented and better indices produced to cover building, contracting and vehicles.

(*b*) A MACHINERY PRICE INDEX; METHODS

This paper deals with the fourth element of fixed capital, machinery. The first difficulty is conceptual : what, for instance, would be meant by a constant price level for electrical control or switch gear, nearly all of which is built to order ; or again how do we allow for the increasing complexity of machine tools in use over this period ? In a field investigation one would search for relatively homogeneous models (in so far as these exist) and then correct for quality changes as best one could. But this paper is not a report of a field investigation, but an attempt to obtain an index from published sources. As all such sources deal with aggregates, no satisfactory answers can be given to the questions above, and we are reduced to the expedient of assuming that tonnage is an adequate measure of quantity. This involves assuming, not only that there is no long-term tendency for machinery to become lighter or heavier, but also that the distribution of purchases between, for instance, half horse-power electric motors and 500 h.p. electric motors does not change from year to year. This assumption must be made, and there are then two sets of sources available, the Censuses of Production (including the Import Duties Inquiries) and the Annual Statements of Trade. The former cover only five years of our period, and can merely serve as a check on the results from export data, which are liable to be misleading for three reasons. They usually fail to distinguish parts separately, they lump second-hand with new machinery and they may not form a representative sample of home production. All these are serious objections for which no correction can here be made, but even so it seemed to be worth carrying out the calculations.

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[1] Clark : *Investment in Fixed Capital in Great Britain*, L.C.E.S. Special Memorandum 49, 1934. There are certain divergences between Clark's results and those of this paper, some of which arise from the difference of methods used. Certain other divergences seem difficult to explain.

[2] Preliminary work in this enquiry was done by Mr. R. Godson. The author has made use of some of this material and wishes to record his thanks.

[3] Fabricant : *Capital Consumption and Adjustment*. N.B.E.R. New York, 1938. Fabricant's index is based on a very small number of machinery and rolling stock prices, combined with an N.B.E.R. index for raw materials and semi-manufactures entering capital goods derived from U.S. Department of Labour statistics of wholesale prices. It thus cannot really be regarded as a fully satisfactory index of capital goods prices.

The method of computation is simple. All new complete machinery is included except that forming parts of vehicles (although agricultural tractors are included) and excluding where possible household and office machinery. This means that all items in Group III G. of the overseas trade returns are included with the exception of railway and tramway motors, certain magnetos, marine machinery, office machinery, vacuum cleaners and machinery accessories. Machinery is then divided into fourteen main groups: Agricultural Machinery, Air and Gas Compressors, Boilers, etc. (including Boilerhouse Plant and Condensers), Cranes, etc. (including Lifts, Conveyers and Excavating Machinery), Electrical Machinery, Machine Tools, Mining Machinery, Prime Movers, Printing, etc. Machinery (including Bookbinding and Carton-Making Machinery), Pumps (excluding Kerbside Petrol Pumps), Sewing Machinery, Textile Machinery, Other Classified Machinery and Miscellaneous Machinery. The last but one group contains all other items for which adequate separate data exist in the export statistics and which do not lead to absurd results. These items are Dairy, Centrifugal Drying, Grain Milling, Paper-making, Sugar Refining, Weighing and Woodworking Machinery. The last group contains all machinery not specified separately in the trade returns throughout the period, and certain other groups such as Pneumatic Tools which show violent and unexplained movements which might be due to changes in definition. Each main group except miscellaneous machinery is then sub-divided into as many sub-groups as are shown separately throughout the period in the export statistics, and for these sub-groups price index numbers are calculated on the basis of average values per ton with 1935 as the base year. The index numbers for the main groups are weighted averages, the weights being based on the total values of new complete home-produced machinery shown in the 1935 Census. The total index for all machinery exports is a further weighted average, the weights being based on the total values of new home-produced machinery minus estimates of exports of new machinery, *i.e.* as near as possible on values of home purchases of new home produced machinery. These export indices are then taken as estimates of the prices of home-produced and -purchased machinery.

Imports form rather over 10 per cent of home purchases of machinery and consequently a similar series was constructed for import prices, but based on fewer sub-groups as quantities were often very small. The weights were based on estimates of retained imports of new machinery. Since the resulting index numbers fluctuate considerably in a random fashion they have not been combined with the export index numbers for the main groups; but they have been so combined for the totals in two different ways. The first method uses fixed weights based on 1935 data, while the second uses a formula which allows for changes in the relative share of the (more expensive) imports in the home market.[1] The second is probably more satisfactory theoretically as imported machinery is not a different commodity from home-produced machinery. But there is no index of home machinery production, and the L.C.E.S. index of Engineering Production (with motor cars and shipbuilding removed) has had to be used to represent the volume of home machinery production.

For the censal years index numbers of home-produced machinery have been calculated from Census data in a similar fashion to that used for exports, except that as no tonnage figures are given for electrical machinery this item has had to be omitted. In all cases alternative total index numbers excluding Miscellaneous Machinery have also been calculated in view of the very unsatisfactory nature of this item. In addition as a rough guide to post-war prices, corresponding figures for 1947 have been calculated, though very little reliance can be placed on such a calculation.

(*c*) CENSUS AND EXPORTS COMPARED

The results of these calculations are shown in Table I, II and III of the Appendix. In the process of calculation it was found necessary to omit sheep shearers and other electrical machinery in view of their very sharp variations, and to interpolate three figures for agricultural tractors for 1930–1932 when the quantity exported was negligible. Otherwise, no adjustments have been made.

If we look at the long-term trends shown by the changes between the mid-twenties and mid-thirties of the export and Census index numbers, we

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[1] The fixed weights are 877 for exports to 123 for imports for all machinery, and 898 to 102 for all except miscellaneous machinery. The formulae for the second type of combined index are

$$\frac{877\,(\text{Export Index}) + 123\alpha_n\,(\text{Import Index})}{1000-74\,(1-\alpha_n)} \qquad \text{for all machinery}$$

and

$$\frac{898\,(\text{Export Index}) + 102\,\alpha_n\,(\text{Import Index})}{1000-63\,(1-\alpha_n)} \qquad \text{for all except miscellaneous machinery,}$$

where α_n is a factor representing the variation from year to year in the proportion of imports by volume in the home market and is 1 for 1935.

find some fair agreements and some very great disagreements. The worst groups are textile and miscellaneous machinery, the former probably because of the large and variable percentage of second-hand machinery exported and the latter because it is a mere hotch-potch of items anyhow. There seems to be agreement on about a 10 per cent fall for agricultural and mining machinery, and both electrical and other classified machinery also fall. Prime movers, boilers, machine tools and printing machinery all rise, while there is little consistent change in the others. From this comparison we find some reason to believe in the reliability of the index for agricultural machinery, cranes, mining machinery and prime-movers. Agreement is mediocre for air and gas compressors, boilers, printing machinery, pumps and other classified machinery, poor for machine tools and sewing machinery and atrocious for textile and unclassified machinery. Overall therefore we may say the agreement is but mediocre, and can give us no great confidence in the results, particularly when we remember that a price rise or fall shown here may merely be due to design changes.

A more detailed study of year to year movements in the two series, shows again the same broad conclusions, six groups having considerable agreement, three poor agreement and four no agreement at all. Even for the group with the best agreement, agricultural machinery, the co-efficient of correlation between the two series is only .46. For the total index there is naturally a rather better agreement as some of the random variations cancel out, but there is a 6 per cent difference in the long-term trend, which is far too large for confidence in the results.

(*d*) MACHINERY PRICES AND THE ECONOMIC BACKGROUND

Remembering these qualifications, can we see any definite and reasonable behaviour in the indices ? Firstly, for all groups there is the 1920–1 inflation, which dies away in the succeeding years. The peak prices, which are about 60 per cent above the level of the mid- and late twenties, come in 1921; the peak prices of iron and steel had come earlier in 1920, when they were nearly 200 per cent above their 1925–7 level. Thus, as one would expect, the movements of prices for finished goods are both smaller and lagged in relation to those for their raw materials. The period of the lag differs for different types of machinery. The price fall for types of machinery mainly built to order (*e.g.* electrical machinery or boilers) only finishes in 1923 while standardised machinery such as machine tools or agricultural machinery is down by 1922. These different time lags which help to maintain machinery prices in bad years are significant in other years as well.

From 1923 until 1930 the total index is fairly stable, with a slight downward trend, price falls for some types cancelling out price rises for others. This steadiness contrasts strongly with the general non-food wholesale price index which steadily decreased from 1924. This disagreement is not surprising as most of the fall in that index was due to textiles and imported raw materials. Iron and steel prices decreased slowly except for a sharp drop from 1924 to 1925 a fall which may explain the smaller corresponding fall in our index. This latter fall may, however, not be significant.

Over the mid and late thirties we find a price rise gaining speed as war drew near. The rise seems sharp compared with that for general prices, but compared with iron and steel it is slow. Just as for iron and steel there is no trace of the 1937–8 recession which must be hidden by the time lags previously mentioned and which anyhow would have a smaller effect because of the rearmament demand. There also seems to be a fairly general agreement on a post-war price rise of 130–150 per cent above 1935.

Thus agreement for these periods with general economic trends is fairly good. The situation is far different for the period of the slump. There is a complete absence of the expected price-fall in this period. There are two factors which help to cause this, devaluation and the catastrophic fall in export volumes. We might expect that foreign countries would import only the vital machinery which could not be made at home during this period, and that this vital machinery would tend to be of the more expensive type. In general, however, there seems to be little relation between volume and price changes, probably because both are linked closely with so many other factors. However, in order to study this effect more closely, and also the devaluation effect, index numbers for separate regions were calculated for 1928–36. These are crude as they are based on the average value of all machinery exports and not categorised into separate groups as before. The results are shown in Table IV. Several of these figures (*e.g.* for the dollar area in 1934) can only be regarded as freak variations, and for most regions it seems difficult to provide satisfactory explanations of the movements. The dollar area seems reasonable until the Roosevelt devaluation in 1933–4, and Western Europe with its steady price rise combined with a very sharp volume drop can be partly explained by the failure to devalue of the countries in this region. Possibly also greater German competition cut out many of our cheaper exports to this region. But the only region for which we obtain phenomena corresponding to home economic conditions is the sterling area, as perhaps we should expect. Its gentle price fall and slow recovery corresponds to the movement of iron and steel prices fairly exactly, and does suggest that a more reliable index could be obtained by considering only exports to the sterling area throughout.

The average unweighted value of all machinery exports to all countries shows an interesting movement compared with our previous export index, as appears in Table V. It suggests that an index on a 1924 basis might have shown a sharper price rise between the two decades (c. 5 per cent instead of c. 1 per cent); this difference probably arises from the greater weight which a 1935 base gives to expanding industries such as electrical machinery. The alteration, however, to a 1924 base would probably not cause such a sharp change in the index as this suggests, as British machinery export markets tend to be in the older more well-established type of machinery, particularly the markets in India and China which were then large.

No detailed figures of import index numbers are given, because they show very great fluctuations, particularly in groups like boilers where imports are a marginal item of less than 2 per cent in total consumption. The figures for the larger groups, *e.g.* machine tools with weight 20.3 per cent or miscellaneous machinery with weight 36.8 per cent are less unstable, and therefore it is reasonable to regard the total import index as having significance when used as a correcting factor to the export index. It shows many of the difficulties discussed above for the export index, and has many similar effects (inflation in 1920–1, fairly steady in the late 1920's, no price fall in the slump, inflation in 1937–9). In addition, partly because of devaluation and partly for other reasons, the index is between 10 and 20 points higher in the thirties than in the twenties. A rough correction to allow for half the imports being priced in dollars shows that after correction there remains a sharp price rise of 12 points between 1932 and 1933, most of which is maintained later ; this indicates that the slump and the Ottawa agreements caused a very considerable change in type and source of imports, and in fact the proportion of dollar imports dropped from about ½ to just over ⅓.

The two combined price series shown seem to differ little from each other, except that they behave rather differently in the slump, mainly because the quantity of imports in 1931 was very much greater than in 1933. Otherwise both series behave much as the export series but with a slightly larger difference between the two decades.

(*e*) CONCLUSION

All these various series have been shown so that readers may make their own choice when using them. In a study of real investment in machinery and plant it would probably be best to use one of the series which excludes the miscellaneous machinery category; and although the second combined price series is more unreliable than the export series, it probably approximates better to a price index of all home-purchased machinery. I hope that in spite of the unreliability of these series they will be found useful in any studies of real investment. But the failure of this attempt to provide reliable series points to the need for the Board of Trade to start publishing figures of machinery prices or at least prices of standardised machinery, as does the U.S. Department of Labor for agricultural machinery, so that economists can have the necessary tools to study investment.

H. J. D. COLE.

APPENDIX

TABLE I. *Export Price Indices for Machinery*

	Weights	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929
Agricultural Machinery	27	183.5	196.1	125.7	124.7	125.1	119.1	123.4	115.9	119.9	117.6
Air and Gas Compressors	15	154.4	166.7	147.7	116.9	102.4	113.6	100.0	101.4	96.8	102.0
Boilers, etc.	72	150.3	153.8	132.1	93.5	94.0	98.0	99.0	102.8	99.2	96.7
Cranes, etc.	87	167.5	167.0	150.7	110.4	103.0	93.1	96.8	101.7	101.7	96.6
Electrical Machinery	267	173.4	205.7	180.1	130.0	124.7	118.3	116.6	108.9	109.9	106.1
Machine Tools	80	109.8	115.3	96.0	82.2	88.2	83.5	85.5	82.9	89.8	99.4
Mining Machinery	11	139.8	168.8	166.1	111.7	121.2	109.9	109.9	109.0	101.4	107.8
Prime Movers	52	122.2	138.7	126.7	95.9	87.8	89.7	91.7	87.5	87.9	88.6
Printing, etc., Machinery	35	102.5	123.9	120.3	102.6	105.1	98.1	96.2	102.2	97.0	102.6
Pumps	25	131.5	148.1	126.5	96.9	93.5	85.0	93.0	92.8	87.1	90.7
Sewing Machinery	12	113.0	128.5	110.5	89.6	81.2	75.3	73.7	99.9	129.7	127.8
Textile Machinery	56	142.5	157.1	137.9	110.5	105.4	104.3	101.2	100.3	96.6	99.7
Other Classified Machinery	48	158.4	161.6	147.8	120.9	123.5	110.7	107.8	105.3	113.9	110.7
Miscellaneous Machinery	213	129.2	126.8	107.4	86.2	82.1	83.5	87.8	87.6	82.0	86.9
Total	1000	147.0	159.8	138.8	106.4	103.2	99.6	100.5	98.8	98.4	98.9
Total (without Miscellaneous)	787	151.8	168.7	147.3	111.9	108.9	104.0	103.9	101.8	102.8	102.1

	1930	1931	1932	1933	1934	1935	1936	1937	1938	1939	1947
Agricultural Machinery...	121.5	118.8	118.6	118.0	115.9	100	98.4	95.4	102.1	102.1	224.9
Air and Gas Compressors	95.6	118.0	103.3	89.1	104.9	100	104.8	118.7	127.1	130.4	269.1
Boilers, etc.	107.2	100.0	97.5	101.0	100.5	100	108.3	109.9	129.9	142.3	271.7
Cranes, etc.	98.7	103.4	104.7	103.1	93.3	100	101.7	112.2	133.1	132.0	243.4
Electrical Machinery	100.7	102.4	97.0	98.6	94.6	100	105.1	109.6	118.9	120.4	225.2
Machine Tools	99.6	107.2	98.2	102.4	97.1	100	105.9	131.8	138.5	129.9	220.3
Mining Machinery	105.2	102.2	105.4	90.5	87.3	100	98.4	103.8	118.7	127.3	254.1
Prime Movers	91.4	94.9	97.2	99.6	108.1	100	100.9	114.3	137.6	153.2	269.2
Printing, etc., Machinery	107.1	112.1	102.6	101.5	109.3	100	98.9	106.2	119.6	123.8	220.3
Pumps	98.8	91.8	94.4	92.0	90.6	100	94.3	104.8	123.7	115.4	210.3
Sewing Machinery	119.7	113.4	121.0	112.9	97.0	100	99.5	103.4	105.5	109.0	166.6
Textile Machinery	102.5	98.9	91.3	95.7	87.4	100	109.1	108.2	119.6	129.4	313.9
Other Classified Machinery	117.7	136.9	120.8	103.4	110.7	100	100.6	112.9	118.2	135.0	256.7
Miscellaneous Machinery	92.0	97.1	99.1	110.5	103.9	100	108.4	110.4	120.0	123.5	245.5
Total	100.4	103.5	100.3	102.5	99.3	100	104.8	111.5	123.4	126.9	242.6
Total (without Miscellaneous)	102.7	105.2	100.6	100.3	98.1	100	103.8	111.8	124.3	127.8	241.8

TABLE II

General Machinery Price Index Numbers

	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929
Exports, *All*	147.0	159.8	138.8	106.4	103.2	99.6	100.5	98.8	98.4	98.9
without Miscellaneous	151.8	168.7	147.3	111.9	108.9	104.0	103.9	101.8	102.8	102.1
Imports, *All*	116.9	110.7	92.5	88.7	95.0	92.8	82.4	83.7	86.8	88.4
without Miscellaneous	112.6	112.0	91.3	86.2	89.1	86.9	79.1	84.7	87.6	88.7
Combined (fixed weights), *All*	143.3	153.8	133.1	104.2	102.2	98.8	98.3	96.9	97.0	97.6
without Miscellaneous	147.8	162.9	141.6	109.3	106.9	102.3	101.4	100.1	101.2	100.7
Combined (adjusted for volume changes), *All*	144.1	154.8	132.8	103.3	101.6	99.3	100.6	98.0	98.1	99.3
without Miscellaneous	148.2	163.4	141.5	108.8	106.6	102.5	102.6	100.8	102.0	101.9

	1930	1931	1932	1933	1934	1935	1936	1937	1938	1939	1947
Exports, *All*	100.4	103.5	100.3	102.5	99.3	100	104.8	111.5	123.4	126.9	242.6
without Miscellaneous	102.7	105.2	100.6	100.3	98.1	100	103.8	111.8	124.3	127.8	241.8
Imports, *All*	89.3	87.9	103.6	108.7	95.5	100	94.9	90.8	98.6	114.7	214.9
without Miscellaneous	88.5	89.7	99.8	110.9	96.4	100	92.1	95.9	102.9	119.2	223.2
Combined (fixed weights), *All*	99.0	101.6	100.7	103.3	98.8	100	103.6	109.0	120.3	125.4	239.2
without Miscellaneous	101.3	103.6	100.5	101.4	97.9	100	102.6	110.2	122.1	126.9	239.9
Combined (adjusted for volume changes), *All*	101.4	105.0	102.5	102.3	98.9	100	104.8	111.2	122.9	128.5	236.7
without Miscellaneous	102.8	106.1	101.7	100.7	98.0	100	103.4	112.0	124.0	129.3	237.9

TABLE III

Price Index Numbers for Home-Produced Machinery
(From Censuses of Production and Import Duties Inquiries)

	1924	1930	1933	1934	1935
Agricultural Machinery	110.3	99.5	100.8	107.8	100
Air and Gas Compressors	90.3	89.4	75.4	89.6	100
Boilers, etc.	90.5	95.7	102.1	103.3	100
Cranes, etc.	100.7	84.8	92.6	96.5	100
Electrical Machinery	—	—	—	—	—
Machine Tools	77.3	101.3	97.5	94.9	100
Mining Machinery	109.1	109.5	96.5	95.9	100
Prime Movers	89.0	90.9	94.8	92.8	100
Printing, etc. Machinery	90.1	105.1	93.6	94.1	100
Pumps	102.9	94.4	99.4	105.9	100
Sewing Machinery	108.3	139.7	116.0	115.0	100
Textile Machinery	78.3	77.3	83.8	94.7	100
Other Classified Machinery	111.8	102.3	96.2	103.0	100
Miscellaneous Machinery	109.3	94.4	98.9	102.6	100
Total without Electrical Machinery	97.8	94.8	96.3	99.6	100
Corresponding Total from Export Data	95.4	100.3	104.0	101.0	100
Total excluding Electrical and Micellaneous Machinery	93.1	95.0	95.2	98.4	100
Corresponding Total from Export Data	100.8	103.7	101.2	99.8	100

NOTE.—The figures for agricultural machinery are very dubious, because of difficulties in getting a consistent average value per ton for agricultural tractors from the Censuses.

TABLE IV

Average Values of all Machinery Exports to certain Areas, 1928–36

	Average Value per ton 1935	Index Numbers								
		1928	1929	1930	1931	1932	1933	1934	1935	1936
U.S.S.R.	116.4	87.4	99.2	83.2	94.0	87.0	111.4	108.3	100	99.7
Eastern Europe[1]	99.3	90.4	100.9	110.8	119.5	127.5	116.0	126.4	100	127.5
Western Europe[2]	142.9	73.5	78.5	76.7	82.0	88.3	94.1	89.1	100	98.3
Scandinavia[3]	96.9	109.3	106.8	116.5	109.1	124.9	129.5	120.6	100	115.5
Sterling Area[4]	96.6	94.4	96.4	97.1	98.3	93.3	88.8	93.5	100	105.9
Dollar Area[5]	137.0	84.8	88.6	83.8	81.9	81.2	96.1	120.1	100	96.9
Latin America[6]	105.8	88.8	88.4	89.1	81.6	112.4	103.4	97.7	100	103.0
Far East[7]	85.7	102.7	93.7	96.7	101.4	105.4	119.1	97.7	100	107.0
All Countries	102.5	92.6	94.3	95.1	97.9	97.3	97.4	99.3	100	105.6

[1] Poland, Czechoslovakia, Hungary, Yugoslavia, Rumania and Greece.
[2] France, Holland, Belgium, Germany, Austria, Italy, Switzerland, Spain and Portugal.
[3] Norway, Denmark, Sweden and Finland.
[4] All British countries except Canada, with Egypt and Iraq.
[5] U.S.A. and Canada.
[6] Mexico, Colombia, Venezuela, Peru, Uruguay, Argentine and Chile.
[7] Japan, China and Siam.

TABLE V

Index Numbers of Average Value of all Machinery Exports

	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929
Index Numbers of Average Value ...	134.0	143.7	125.3	100.4	94.2	92.8	93.6	95.1	92.6	94.3
Difference from previous Export index numbers	—13.0	—16.1	—13.5	—6.0	—9.0	—6.8	—6.9	—3.7	—5.8	—4.6

	1930	1931	1932	1933	1934	1935	1936	1937	1938	1939
Index numbers of Average Value ...	95.1	97.9	97.3	97.4	99.3	100	105.6	110.8	122.9	126.3
Difference from previous Export index numbers	—5.3	—5.6	—3.0	—5.1	0	0	+0.8	—0.7	—0.5	—0.6

THE NATIONAL INCOME IN 1950 AND FUTURE PROSPECTS

(All tables contain figures in £ millions at annual rates. For notes see earlier issues of the BULLETIN, especially May 1950)

THE AGGREGATE

It will be appreciated by those who have followed our earlier papers that we are working within the framework of the National Income White Paper,[1] and that in particular we use the official estimates, in this case for 1949, as a base, obtaining the quarterly estimates from various indices. Our estimates for the year 1950 are not worked out afresh from income or production data. They are merely the average of the quarterly figures. Since the official 1949 estimates are now doubtless somewhat out of date, the 1950 estimates have been shown throughout as a percentage of those for 1949.[2]

TABLE I

National Income at Current Factor Cost, Seasonally Corrected

Sector	1949	1950	*1950 as % of 1949*	1950			
				I	II	III	IV
Agriculture	590	590	*100*	595	590	585	585
Industry	5850	6470	*110½*	6280	6460	6510	6640
Services...	3130	3280	*105*	3160	3260	3350	3350
Total Business	9570	10340	*108*	10035	10310	10445	10575
Government	1130	1135	*100½*	1120	1115	1130	1175
Other	425	470	*110½*	460	465	475	485
Gross National Income	11125	11945	*107½*	11615	11890	12050	12235
Less Depreciation	—975	—1015	*104*	—1000	—1010	—1020	—1030
Net National Income	10150	10930	*107½*	10615	10880	11030	11205

TABLE II

National Income at Average 1949 Factor Cost, Seasonally Corrected

Sector	1949	1950	*1950 as % of 1949*	1950			
				I	II	III	IV
Agriculture	590	555	*94*	570	560	545	540
Industry	5850	6330	*108*	6140	6310	6370	6480
Services...	3130	3220	*102*	3190	3190	3250	3250
Total Business ...	9570	10105	*105½*	9900	10060	10165	10270
Government	1130	1110	*98*	1115	1105	1105	1115
Other	425	435	*102½*	425	430	440	450
Gross National Income	11125	11650	*104½*	11440	11595	11710	11855
Less Depreciation	—975	—1015	*104*	—1000	—1010	—1020	—1030
Net National Income	10150	10635	*105*	10440	10585	10690	10805

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[1] Except that our definitions exclude inventory gains throughout and are in principle net of depreciation at replacement cost.

[2] Even these percentages may be thrown out for the aggregates if the estimates of sector totals (*i.e.* the weights) are out-of-date.

Our estimates show a rise of slightly under £800 millions in the net national income, very much the same in fact as from 1948 to 1949 (when it was about £750 millions, on our definitions). The change in net real income was also much the same, about £450–£500 millions at constant prices. The difference was in the nature of the increase. From 1948 to 1949, all sectors contributed to the increase in real income : between 1949 and 1950 the real output of Agriculture apparently dropped (because of the poor harvest), as did the real output of the Government sector, which was showing a fall in employment till the Korean war started.[1] The increased output in the Service sector did not much exceed these falls, so that virtually the whole of the increased real output came from the Industrial sector.

The estimates for the value of agricultural output have been revised in the light of new material which the Ministry of Agriculture has very kindly put at our disposal. Our figure for the third and fourth quarters of 1950 is a forecast of the value of output for the crop-year 1950–51, and since the period is still uncompleted the figure is necessarily subject to revision when fuller information becomes available. In arriving at the estimates for the value of output in 1949 prices, the price index for agricultural products has been smoothed so as to give a steady increase over the two years, and the figures given here therefore differ from those which appeared in previous articles.

The estimates for the services sector have been recalculated, and minor revisions have in consequence been made. It will be seen that the rise in the value of output in 1950 apparently took the form of a rise in volume of some three per cent and a rise in price of about two per cent. The price-increase mainly reflects the rise in the Interim Index of Retail Prices and the increase in railway freight charges which came into effect in May. The increase in volume represents higher retail turnover and an expansion in transport other than the railways.

In the industrial sector, the composite price index, about which we have written much before, continued steady till the end of the year, the ‘ output ’ prices we used seeming just about to cover the rises in the import price index, after allowing for a time-lag, and suggesting continued stability in unit factor cost.

The increase in the real value of the industrial product, at £400–£500 millions in fixed prices, is £100 millions more than the corresponding rise between 1948 and 1949. It is too early as yet to carry our productivity estimates by industry far enough forward to give a detailed analysis covering the whole year. We can however show the development for the whole sector since the start of the production index, by linking together the old and new employment series.[2]

We can see here a definite acceleration in productivity growth, and also

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[1] Our previous view that, there was a greater real increase last year than in the preceding one, was due to insufficient allowance for these falls.

[2] With the help of the overlap in the second half of 1948. The manpower aggregate for this sector seems to be on the new basis 1.106 times what it would have been on the old basis.

The Post-War Growth of Industrial Production

(1946=100)

	Production	Employment	' Productivity '
1948	121	110½	109½
1949	129	112	115
1950	140	114	122½
1948* I	118	110½	107
II	119½	110½	108
III	121½	110½	110
IV	124	111½	111
1949[1] I	124½	111½	111½
II	128½	111½	115
III	129½	112	115½
IV	133	113	117½
1950 I	135½	113	120
II	139	113½	122½
III	140½	114	123
IV	143†	115	124½†

* Quarterly production estimates are seasonally corrected, and hence the 'productivity' estimates are corrected too.

† Provisional.

about when it occurred. Up to 1949 the rise was continuing at about 5 per cent per annum, slightly slowed up by the fuel crisis in 1947. Then after the first quarter of 1949, it started to increase at a fairly steady rate of two points a quarter, or about 7 per cent per annum, though there seems to have been some slight slowing up of the rate of increase in the latter part of 1950.[1]

DISTRIBUTIVE SHARES

The wage-bill, after increasing comparatively slowly over the first three quarters of 1950, shows a sudden upward surge in the fourth quarter. This increase is largely due to the sharp rise in the Ministry of Labour index of weekly wage-rates, which, after standing at 110 (June 1947 = 100) since the beginning of the year, moved to 114 during the last quarter. Wage-rate increases were fairly widespread, major rises being granted in engineering, shipbuilding and agriculture. It is interesting to note that the wage-bill increased between 1948 and 1949 by about the same proportion as *real* national output (5 per cent), suggesting that unit labour cost was unchanged over the period, though this average stability was the resultant of a fall in the first three quarters and a rise thereafter.

The movement of the wage bill is paralleled by a sharp rise in the salary bill (a notable increase having been granted to civil servants) and in Forces' Pay, the estimate attempting to take account of the substantial increases in rates granted from Sept. 1st, 1950.

The increase in these components provide the explanation for the failure of the profit residual to rise further. Until then it had absorbed the greater part of the increased national income (both concepts, we should repeat, excluding inventory gains). Compared to a rise of about £400 million in the profits residual over 1948–9, there seems to have been an acceleration in the profit trend, though this was at least temporarily suppressed by the wage rises in the fourth quarter.

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[1] The provisional index number of 138 for December is a slight danger signal here, because even after correction for seasonal influences this only suggests a value of about 140. Individual monthly values are, however, often 3—4 points off the trend.

TABLE III

National Income by Distributive Shares. Seasonally Corrected

Source	1949	1950	*1950 as % of 1949*	1950			
				I	II	III	IV
Wages	4280	4485	*104½*	4415	4445	4470	4615
Salaries	2250	2305	*102½*	2280	2290	2305	2330
Forces' Pay	245	235	*96*	230	220	230	265
Rest	470	480	*102*	475	480	480	480
Profits and Interest	2905	(3425)	*118*	(3215)	(3445)	(3545)	(3515)
Net National Income	10150	10930	*107½*	10615	10880	11030	11205

PERSONAL INCOME

The method of estimating personal income and saving was fully discussed in a previous paper.[1] There have been some changes in estimates for earlier quarters, mainly as a result of revisions in estimates of agricultural output (hence of farmers' income) and of consumption. The revision to the estimate of consumption in the third quarter makes the saving residual show virtually no change, compared to the increase yielded by the previous and lower estimate of consumption. This emphasises how sensitive to errors the estimate of saving is, and how cautious interpretation should therefore be. The overall picture suggests that saving, before provision for death duties, and net of inventory gains, was about the same in 1950 as in 1949, though this was probably due to a decline in the spring of 1949 to a level which was maintained till a rise in the last quarter of 1950, suggesting a fairly symmetrical development over the two years.

TABLE IV

Personal Income and Saving[2]

	1949	1950	*1950 as % of 1949*	1950			
				I	II	III	IV
Personal Income ...	10140	10600	*104½*	10465	10510	10600	10870
Less Tax Liabilities ...	—1340	—1380	*103*	—1420	—1340	—1355	—1400
Disposable Income ...	8800	9220	*105*	9045	9170	9245	9470
Less Consumption ...	—8410	—8835	*105*	—8705	—8770	—8885	—8950
Personal Savings ...	(390)	(385)	*(99)*	(340)	(400)	(360)	(520)

[1] Inventory gains and taxes thereon, and capital taxes are excluded throughout.

[2] See BULLETIN for January, 1951.

BALANCE OF PAYMENTS

The final figures for the balance of payments support the suggestion made in our previous article, that the current account surplus for the year may have been nearly £250 millions. There was a fall in the surplus between the third and fourth quarter, because of the remarkably high import values in the fourth quarter.[1] Over the year as a whole, the outstanding feature has been the rise in exports. According to the Board of Trade Index, the volume of visible exports in 1950 was about 15 per cent greater than in 1949, and during the last quarter of 1950 it was 25 per cent greater. The expansion has been greatest (as one would expect) in the case of sales to countries which did not devalue their currencies, or devalued by less than 30 per cent, in 1949. At the same time, there has been a striking increase in the value of 'invisible' exports. Cmd. 8065 indicates that shipping earnings have increased considerably, but the most important change has been in the rather mysterious portmanteau item 'Other (net)'. It seems likely that much of this is due to an increase in earnings under the item 'overseas transactions of British oil companies'.

As a result of this increase in exports, the current account balance improved considerably, to about £175 millions for the second half of the year, despite the fact that the volume of imports was maintained and import prices were appreciably higher in 1950 that in 1949.[2]

Table V

Foreign trade at current prices, NOT seasonally corrected

	1949	1950	*1950 as % of 1949*	1950			
				I	II	III	IV
Visible Imports ...	1965	2320	*118*	2170	2430	2235	2460
Invisible Imports ...	540	540	*100*	510	505	590	550
Total Payments ...	2505	2860	*114*	2680	2935	2825	3010
Visible Exports ...	1820	2220	*122*	2100	2070	2230	2485
Invisible Exports ...	650	870	*134*	785	870	915	915
Total Receipts ...	2470	3090	*125*	2885	2940	3145	3400
Surplus (+) or Deficit (−) ...	—35	+230		+205	+5	+320	+390

[1] In comparing the estimates for the second half of 1950 with those for the first six months it should be remembered that a higher correction factor has been applied to imports in the second period. If the correction factor had been the same, the value of imports in the latter half of the year would have been greater.

[2] The import price index was over 15 per cent higher.

TABLE VI

Foreign trade at current prices, seasonally corrected

	1949	1950	*1950 as % of 1949*	1950			
				I	II	III	IV
Visible Imports ...	1965	2320	*118*	2260	2310	2235	2485
Invisible Imports ...	540	540	*100*	525	525	535	570
Total Payments ...	2505	2860	*114*	2785	2835	2770	3055
Visible Exports ...	1820	2220	*122*	2080	2110	2280	2410
Invisible Exports ...	650	870	*134*	785	875	905	920
Total Receipts ...	2470	3090	*125*	2865	2985	3185	3330
Surplus (+) or Deficit (—)	—35	+230		+80	+150	+415	+275

CONSUMPTION

In our table of consumption expenditure we do not show a detailed analysis for the fourth quarter of 1950, because the data available at time of going to press are inadequate to enable such a breakdown to be made with any accuracy. We do, however, show annual totals which imply an estimate for the fourth quarter: the justification for this procedure being that the inaccuracies in the rough working estimates which we use for the fourth quarter are unlikely to disturb the annual figures greatly.

We have also dropped the detailed quarterly fixed-price estimates: as explained in the January BULLETIN, we intend to alter the method of calculating these estimates in future.

The changes in consumption expenditure between 1949 and 1950 are remarkably similar to those which took place between 1948 and 1949. Once again it is the expenditures on food, household goods and clothing which show the sharpest increases, whilst expenditures on drink and tobacco show little change. Both in 1949 and 1950, the proportion of total annual expenditure absorbed by these latter items has tended to decline (though the decline seems to have been arrested in the latter part of the year).

Reference to the fixed price table shows that well over half of the increased expenditure represented a ' quantity ' increase, the remainder being accounted for by the continuing increases in prices. Food prices, in particular, increased sharply between 1949 and 1950, and the ' quantity ' increase for this item was modest compared with the ' value ' increase.

TABLE VII

Final Consumption at current prices, seasonally corrected

	1949	1950	*1950 as % of 1949*	1950		
				I	II	III
Food ...	2380	2590	*109*	2635	2610	2500
Drink ...	720	730	*101*	685	715	750
Tobacco ...	765	770	*100½*	730	775	825
Rent and Rates	615	630	*102*	620	630	630
Fuel and Light	350	370	*105½*	365	370	370
Household goods	580	630	*108½*	635	605	635
Clothing ...	950	995	*104½*	950	945	1045
Other ...	2055	2120	*103*	2085	2120	2130
Total ...	8410*	8835	*105*	8705	8770	8885

* Detail does not add to total because of rounding.

TABLE VIII

Final Consumption at average 1949 prices

	1949	1950	*as % of 1949*
Food	2380	2440	*102½*
Drink	720	750	*104*
Tobacco	765	765	*100*
Rent and Rates	615	625	*101½*
Fuel and Light	350	365	*104*
Household Goods	580	615	*106*
Clothing	950	985	*103½*
Other	2055	2095	*102*
Total	8410*	8640	*103*

* Detail does not add to total because of rounding.

NATIONAL EXPENDITURE

If we compare these preliminary estimates with forecasts in the *Economic Survey*, we find that as usual the rise in the national income appears to have been greater than anticipated. The rise in industrial productivity has been about double the 3½ per cent expected, and there was in addition a slight rise in the labour force. Together these yielded nearly £500 millions higher output, instead of £200 millions, working at fixed prices. There has also been a rise of something like another £200 millions from other sectors, compared to £100 millions forecast,[1] so that altogether G.N.P. at current factor cost, net of inventory gains, was nearly £400 million above expectation.

A large part of this unexpected increase appears to have been used in raising personal consumption more than was anticipated. It is interesting to note that the effect of the continued cautious productivity estimates in recent years must have been to keep the capital investment below what would otherwise have been thought possible, with some overflow of output running into consumption. The paradoxical result has been that a sober assessment of productivity has meant provision for the present rather than the future. Caution has implied extravagance.

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[1] It is incidentally curious that the *Survey* forecast an unchanged net income from abroad despite the sharp rise given by devaluation to the sterling value of remittances from countries which did not devalue.

The other use of output which has exceeded forecast is the export surplus. *The Survey* modestly hoped that the balance of payments might ‘ even show a surplus on current account ’. Actually during 1950 visible exports increased by some £400 millions over 1949 compared to £210 millions anticipated, and for the whole of the second half we were nearly in balance on visible account. The *Survey* was cautious about imports, but the increase seems to have been slightly greater than was expected. It implied an invisible surplus of about £200 millions, which also appears an under-estimate.

Indications about Government current spending are very slight, but it is possible that (contrary to our previous impression) this has been, despite the Korean war, running under expectations. The implied movement of capital investment is very tentative, being the residual of so many other estimates. It suggests about the same level as 1949 at current prices, but a fall (doubtless due to destocking) when price changes are taken into account.

TABLE IX

National Expenditure at Current Prices NOT Seasonally Corrected

	1949	1950	*1950 as % of 1949*	1950			
				I	II	III	IV
Consumption ...	8410	8835	*105*	8220	8735	9070	9320
Govt. current spending	2035	2175	*107*	2150	2165	2170	2215
Net Investment ...	1380	(1465)	(*106*)	(1625)	(1805)	(1085)	(1415)
Export deficit (—) ... or Surplus (+) ...	—40	+230		+205	+5	+325	+390
Net National Product	11785	12705	*108*	12200	12710	12650	13340
Less net indirect Taxes	—1635	—1775	*108½*	—1575	—1770	—1900	—1855
Net National Income	10150	10930	*107½*	10625	10940	10750	11485

TABLE X

National Expenditure at Current Prices, Seasonally Corrected

	1949	1950	*1950 as % of 1949*	1950			
				I	II	III	IV
Consumption ...	8410	8835	*105*	8705	8770	8885	8950
Govt. current spending	2035	2175	*107*	2150	2165	2170	2215
Net Investment ...	1380	(1465)	(*106*)	(1320)	(1560)	(1410)	(1615)
Export deficit (–) ... or Surplus +) ...	—40	+230		+80	+150	+420	+275
Net National Product	11785	12705	*108*	12255	12645	12885	13005
Less net indirect Taxes	—1635	—1775	*108½*	—1640	—1765	—1855	—1850
Net National Income	10150	10930	*107½*	10615	10880	11030	11205

TABLE XI

National Expenditure at Average 1949 Prices, Seasonally Corrected

	1949	1950	*1950 as % of 1949*	1950			
				I	II	III	IV
Consumption ...	8410	8640	*103*	8540	8590	8690	8730
Govt. current spending	2035	2120	*104*	2120	2115	2115	2125
Net Investment ...	1380	(1160)	*(84)*	(1235)	(1210)	(1050)	(1125)
Export deficit (—) ... or Surplus+) ...	—40	+440		+210	+355	+605	+595
Net National Product	11785	12360	*105*	12105	12270	12460	12575
Less net indirect Taxes	—1635	—1725	*105½*	—1665	—1685	—1770	—1770
Increase	10150	10635	*105*	10440	10585	10690	10805

FUTURE PROSPECTS

In assessing prospects, very different answers can be reached according to the base period used. If we took the calendar year 1950 as base and tried to forecast items for the calendar year 1951, the outlook would seem more hopeful than if we worked in fiscal years, because of the time it will take the arms programme to become an effective burden. Thus for the calendar years, an expectation of 4 per cent rise in industrial productivity would not seem unreasonable—it may perhaps have been about achieved already. But for the financial years it would look slightly harder to achieve. On the other hand the export surplus was much larger in the second half of the year, which really had in fact a different shape economically from the first half, since the export opportunities due to Western rearmament had arrived without the corresponding strain of raw material shortages or rapidly rising internal prices.

Because of the rather rapidly changing situation, it would seem preferable to take a *date* rather than a *period* as base for forecasting, and the best date seems to be end-September 1950, which came roughly at the beginning of the new period of rearmament, and lay in the middle of the fiscal year which is now ending. The basic national accounts at that date were approximately as follows (in seasonally corrected annual rates):

Annual Rates of Income and Expenditure at end-September, 1950

Net National Product	12950	Consumption	8925
Less Export Surplus	—350	Government Current Spending ...	
		Civil	1325
		Military	875
		Net Capital Investment	(1475)
Net Resources: Available at Home	12600	Net Resources Used at Home ...	12600

To show the impact of the new arms programme on the economy, we shall attempt to predict the situation at end-September, 1951. Let us first work in real terms, ignoring price changes, except for rises in import prices (which do constitute a 'real' change as far as we are concerned). The official 4 per cent would seem a rather high increase for next September over last September. Much depends on such factors as industrial unrest and material supplies, but if we allowed for overall industrial productivity to be six months hence only slightly above the New Year level, and also for rather better agricultural experience, we would obtain a level of output £200 m. higher than in September 1950. The Chancellor implied a loss of 'at least' £300m. owing to the turning of the terms of trade further against us. It is not quite clear whether he was thinking in calendar years, or fiscal years, but in either case it would seem an estimate appropriate to our forecast. It is presumably obtained as the difference between a rise in imports of some £600m. (annual rate) due to price rises, less about £300m. rise in exports due to the rise in export prices. However, part of the latter will reflect increased costs at home, and must be excluded for the moment, since we are assuming fixed factor cost, and we are left with £100 m. due to the import content of exports.[1] Let us also take it that the new annual rate of military expenditure has been reached by then.[2] In this case the real cost of changes over this 12 months could be shown as :

(£ millions, annual rates)	
Increased Military Spending	£425
Increased Cost of Imports	£600
Less Induced rise in Export Value	—£100
Less Increased national output	—£200
	£725

Some of this will be offset (£200m. if we follow the Chancellor)[3] by other rises in export prices, due to higher internal costs and, possibly, revaluation. Still clearly something must be found by reductions in the national output going to exports, consumption, Government civil spending and investment. There can hardly be any net fall in the last of these, because destocking must change to stockbuilding, and there will be some capital investment for the arms programme in the private sector, which must outweigh any economies due to shortages of capital goods. Suppose that on balance investment rises about £125m. though this is admittedly very speculative. Assuming that shortages of supply reduce the quantitity of exports by £100m., and Government civil spending slightly; and that the import price rise induces £50m. increase in capital investment, and £25 m. in Government civil spending, we have the following picture for September 1951 :

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[1] The Chancellor's statement implies a pair of assumptions about import prices and factor cost in export industries, *e.g.* a 20 per cent rise in import prices and 3 per cent rise in export factor cost, a 25 per cent rise in import prices and 9 per cent rise in export factor cost, or a 30 per cent rise in import prices and 15 per cent rise in export factor cost (assuming imports form 20 per cent of the value of exports). The second of these assumptions appears the most plausible, since he could hardly anticipate the rises in factor cost otherwise implied. It would also account for the 'at least'.

[2] The officially announced rate is measured in costs current in February, 1951. It therefore allows for higher factor cost than at September 1950, but on the other hand for lower import costs than have been assumed here.

[3] Or strictly, to provide a net deterioration of £300m. in the terms of trade, as the Chancellor suggested.

Illustrative Annual Rates of Income and Expenditure at end-September, 1951

I. (Assuming factor cost unchanged since end-September, 1950)

Net National Product	13150	Consumption	9125
Plus Import Surplus	250	Govt. Current spending :	
		Civil	1325
		Military	1300
		Net Capital Investment	1650
Net Resources Available at Home	13400	Net Resources Used at Home ...	13400

This would indicate a fall in real consumption of about £200 millions, or 2—2½ per cent, since a price rise of £400m., owing to higher import prices, has been written into the consumption estimates.

The assumption about unchanged factor cost is however very unrealistic. While fixed price forecasts could usefully be made in the past, the current change in factor cost is so great as to be a major influence on the whole development.[1] The purpose of working in two stages, taking account first of ' real ' then of factor cost changes, is simply procedural, in that it allows a clearer judgement of the underlying assumptions, and a separation of influences. It also allows the effect of alternative assumptions about factor cost to be judged. If we make such alternative assumptions, we can show something of the margin for error in such forecasts, and also indicate what is involved in a fast as opposed to a slow rise in internal incomes. The relevant information here is the index of wage rates, since in a period of slowly rising productivity, this would only move slightly faster than an index of unit labour cost. Given the cost accounting procedures often used[2] and the strength of demand for output, an index of unit labour cost in turn amounts to an index of overall factor cost per unit of output. The wage-rate index superficially rose 4 points, or about 3½ per cent, in the last quarter of 1950. There is, however, a slight snag here due to rounding. The September figure was the last of nine consecutive estimates of ' 110 ', over a period when there was at least some slight upward rise. It can therefore be taken as about 110.4 to one decimal place, so that an estimated rise of 3 per cent would be nearer.[3] This suggests a rise of some 12 per cent over the year concerned, though the increase depends on many factors including how long wage increases already announced satisfy those who have received them. Allowing for the productivity rise, it would seem that the increases in unit factor cost might be about 7½ per cent to 10 per cent, and we shall in fact work with both these figures. Such a rise would tend to be spread fairly evenly outside the Government sector, where the increase would be somewhat damped by the inflexibility of rates of pay. The two assumptions would then yield national accounts as follows[4] :

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[1] Even the 'real' development, in so far as it reduces the loss resulting from the deterioration in the terms of trade.

[2] *i.e.* the use of percentage ' gross margins '.

[3] As we have suggested before, the wage-rate index should be quoted to at least the nearest half unit.

[4] No change in net indirect tax is assumed for although *ad valorem* taxes will increase, there will be some fall in the receipts of taxes on consumer durables, because of shortages, and on luxuries in as far as rising living costs enforce some economies.

National Income and Expenditure at end-September, 1951

II. (Assuming factor cost 7½ per cent above end-September 1950)

Net National Product	13950	Consumption	9550
Import Surplus	100	Govt. current spending :	
		Civil	1400
		Military	1350
		Net Capital Investment	1750
Net Resources Available at Home	14050	Net Resources Used at Home ...	14050

The Government might of course not consider such an import surplus tolerable, though apparently there is still a possibility of American economic aid which would in effect finance it without any net loss of oversea assets.[1]

National Income and Expenditure at end-September, 1951

III. (Assuming factor cost 10 per cent above end-September, 1950)

Net National Product	14250	Consumption	9725
Import Surplus	75	Govt. current spending :	
		Civil	1425
		Military	1375
		Net Capital Investment	1800
Net Resources Available at Home	14325	Net Resources Used at Home ...	14325

The final step is to see what degree of inflationary pressure is indicated by these assumptions. For incomes we make the following assumptions : Wages are assumed to remain the same proportion of national income[2] (which is likely in that much of the price rise will be wage-induced), Salaries to rise at a rather slower rate than unit factor cost, Farmers' income to gain slightly (consistent with the assumption of higher agricultural output), Professional earnings to be unchanged, Dividend payments to rise but also by rather less than unit factor cost, and Transfers to continue on the upward trend. For Sole Traders, we could no longer use the previous method of linking their income to retail turnover, since we can no longer assume costs constant, and we had to guess here. Once having estimated income, the tax liabilities are given by the marginal tax rates we use, provided we make the relevant assumption that the tax rates are unchanged. Finally consumption expenditure is taken from the table above.

These calculations are necessarily rough.[3] They have been fully worked out because any assessment of the immediate future should take *all* likely developments into account—anticipated changes in output, prices, taxes and resource allocation. They suggest—one cannot put it stronger—that the shortage of consumer goods will have made the ' gap ' between incomes and consumption £150m. wider by next autumn, compared to last autumn.

We should emphasise that we are not predicting that voluntary saving will be £150m. higher. This is merely the addition to savings that will be required, if tax rates are unchanged, to release resources for the arms

[1] The Chancellor has also announced that the Government would be prepared to run down foreign exchange reserves to finance stockpiling of materials.

[2] *i.e.* to move with total factor cost and with productivity.

[3] In particular it should be remembered that indirect taxes are assumed constant in aggregate. If they rise at all, the inflationary gap will be closed to that extent.

Annual Rates of Personal Income and Saving

	End-September 1950	*End-September, 1951*	
		Assuming 7½% rise in factor cost	*Assuming 10% rise in factor cost*
Wages	4500	5000	5125
Salaries	2325	2450	2500
Forces' Pay	250	325	325
Mixed Incomes	1350	1450	1475
Distributed Property Income	1525	1600	1625
Transfer Incomes	775	800	800
Total Personal Income	10725	11625	11850
Less Tax Liabilities	—1375	—1500	—1550
Disposable Income	9350	10125	10300
Less Consumption	—8925	—9550	—9725
Personal Savings	425	575	575

programme. Since it is unlikely that people would voluntarily save £150m. more this additional amount is an indication of the widening of the inflationary ' gap ', the *ex ante* gap between investment and anticipated voluntary saving. Thus the Government would need either a higher import surplus, or lower capital investment, or lower civil expenditure, or higher taxes, to reduce this gap, if it wants an arms programme of the magnitude contemplated without increased inflationary pressure.

This of course only refers to next autumn. After that, since it appears that military expenditure will continue to increase more rapidly than national income, there will be a continued fall in real consumption and a continued widening of the inflationary ' gap ', particularly since we will not be able to run down an export surplus (though presumably international allocation of raw materials will by then be keeping import prices down).

It is interesting to note that the sharper price rise seems to have very little effect on the inflationary ' gap' . This is because the rises in incomes are balanced by the induced rises in income tax and retail prices. Such estimates of course take into acount only the most ' macro-economic ' considerations. They do not, for example, allow for any special raw material difficulties, such as a more acute coal shortage, that might result from the pressures of rearmament : nor for any changes in savings propensities that might result from alterations in income distribution or from expectations of further price rises. This is very far from the whole story,[1] but on the other hand it would take a series of cumulating errors to disturb the main conclusions greatly. For the present the economist's calculations of the net depressive or stimulating effect of economic events must take the form of working out the *direct* implications of certain assumptions. Such conclusions can at most tell us the rough size of the problem, but it is something to know that.

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[1] One is almost tempted to say that any resemblance to actual situations would be purely coincidental.